PATENT

Attorney Docket No. 015258-055600US
Client Reference No. P.7067

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

CHRISTIAN ENGELER, et al.

Application No.: Not yet assigned

Filed: Herewith

For: COLUMN FOR CARRYING OUT AN ISOTOPE EXCHANGE BETWEEN A LIQUID SUBSTANCE AND A GASEOUS SUBSTANCE

PRELIMINARY AMENDMENT

San Francisco, CA 94111
November 13, 2001

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the examination of the above-referenced application, please enter the following amendments and remarks.

IN THE ABSTRACT:

Please substitute the following amended, clean version of the Abstract (a marked-up version of the changes to the Abstract is attached to this Amendment):

COLUMN FOR CARRYING OUT AN ISOTOPE EXCHANGE BETWEEN A LIQUID SUBSTANCE AND A GASEOUS SUBSTANCE

ABSTRACT OF THE DISCLOSURE

The column is provided for carrying out an isotope exchange (EM) between a liquid substance (L) and a gaseous substance (G) using a catalytic reaction (EK). In this reaction the isotope exchange between molecules of the vaporized liquid substance (V) and molecules of the gaseous substance (G) takes place through a heterogeneous catalysis. The column comprises a plurality of modules (M) which are arranged vertically one above the other

and which are in each case subdivided into two regions K and A which are serially connected by a connection region (C). The catalytic reaction can be carried out in the region K on a first packing (2). A substance exchange (E1, E2) between a liquid and a gaseous phase which contains vapor can be carried out in the region A by means of a second packing (3) for compensating substance concentrations. During the operation of the column a transport of the gaseous substance (G, V) which contains vapor is driven through the modules as a result of pressure gradients. In this the transport direction is changed at least once in the connection region, and indeed from a downward direction to an upward direction, whereas the liquid substance (L) is forwarded downwardly through the modules through the action of gravity alone.

IN THE CLAIMS:

Please substitute the following amended, clean versions of the indicated claims (a marked-up version of the changes to the claims is attached to this Amendment):

3. (amended) Column in accordance with claim 1, characterized in that a filling of porous particles, on the surface of which a catalytically active material is applied, is used for the first packing (2).

4. (amended) Column in accordance with claim 1, characterized in that an ordered packing (3) which is in particular built up of vertical layers, with the layers containing inclined channels which are produced from corrugated material surfaces and thereby form a cross channel structure with openly crossing channels, is in each case used for the material exchange in the regions A.

5. (amended) Column in accordance with claim 1, characterized in that in each case a liquid collector (5) which contains a siphon-like drain (50) by means of which an upward passing through of gas (G, V) can be prevented is arranged beneath the regions A.

6. (amended) Column in accordance with claim 1, characterized in that the second packing (3) is located in a cylindrical chamber (3') which forms the region A; in that the connection region (C) comprises a first ring space (4) which is arranged concentrically to the region A; and in that the region K is formed by a second concentric ring space (2').

7. (amended) Column in accordance with claim 1, characterized in that the region K is composed of a plurality of partial regions (K1, K2, K3, K4) which are arranged in parallel; and in that the space between these partial regions forms a part of the connection region (C).

8. (amended) Column in accordance with claim 1, characterized in that the second packing (3), the packing of the region A, is manufactured of copper; and in that the surface of the copper can be easily wetted as a result of a copper oxide film.

9. (amended) Use of a column (1) in accordance with claim 1 for the de-enrichment of tritium from heavy water, with deuterium being used as gaseous substance (G) and the heavy water forming the liquid substance (L), with tritium being taken up from this

substance by the deuterium and with the deuterium which is charged with the tritium being regenerated in a low temperature column (6), with tritium being separated off.

10. (amended) Use of a column in accordance with claim 1 for the winning of heavy water, with hydrogen which contains deuterium forming the gaseous substance (G) and with deuterium being given off from this substance to heavy water, which forms the liquid substance (L), with light hydrogen (protium) simultaneously being taken up.

REMARKS:

Claims 1-10 are pending.

Amendment is made to delete a minor informality int the Abstract and to eliminate all multiple dependencies from the claims, thereby avoiding the need to pay the multiple dependent surcharge.

Respectfully submitted,

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MARKED-UP VERSION OF THE CHANGES TO THE ABSTRACT

Abstract of disclosure

The column is provided for carrying out an isotope exchange (EM) between a liquid substance (L) and a gaseous substance (G) using a catalytic reaction (EK). In this reaction the isotope exchange between molecules of the vaporized liquid substance (V) and molecules of the gaseous substance (G) takes place through a heterogeneous catalysis. The column comprises a plurality of modules (M) which are arranged vertically one above the other and which are in each case subdivided into two regions K and A which are serially connected by a connection region (C). The catalytic reaction can be carried out in the region K on a first packing (2). A substance exchange (E1, E2) between a liquid and a gaseous phase which contains vapor can be carried out in the region A by means of a second packing (3) for compensating substance concentrations. During the operation of the column a transport of the gaseous substance (G, V) which contains vapor is driven through the modules as a result of pressure gradients. In this the transport direction is changed at least once in the connection region, and indeed from a downward direction to an upward direction, whereas the liquid substance (L) is forwarded downwardly through the modules through the action of gravity alone.

[(Fig. 2)]

MARKED-UP VERSION OF THE CHANGES TO THE CLAIMS

3. (amended) Column in accordance with [claim 1 or claim 2] claim 1, characterized in that a filling of porous particles, on the surface of which a catalytically active material is applied, is used for the first packing (2).

4. (amended) Column in accordance with [any one of the claims 1 to 3] claim 1, characterized in that an ordered packing (3) which is in particular built up of vertical layers, with the layers containing inclined channels which are produced from corrugated material surfaces and thereby form a cross channel structure with openly crossing channels, is in each case used for the material exchange in the regions A.

5. (amended) Column in accordance with [any one of the claims 1 to 4] claim 1, characterized in that in each case a liquid collector (5) which contains a siphon-like drain (50) by means of which an upward passing through of gas (G, V) can be prevented is arranged beneath the regions A.

6. (amended) Column in accordance with [any one of the claims 1 to 5] claim 1, characterized in that the second packing (3) is located in a cylindrical chamber (3') which forms the region A; in that the connection region (C) comprises a first ring space (4) which is arranged concentrically to the region A; and in that the region K is formed by a second concentric ring space (2').

7. (amended) Column in accordance with[any one of the claims 1 to 5] claim 1, characterized in that the region K is composed of a plurality of partial regions (K1, K2, K3, K4) which are arranged in parallel; and in that the space between these partial regions forms a part of the connection region (C).

8. (amended) Column in accordance with [any one of the claims 1 to 7] claim 1, characterized in that the second packing (3), the packing of the region A, is manufactured of copper; and in that the surface of the copper can be easily wetted as a result of a copper oxide film.

9. (amended) Use of a column (1) in accordance with [any one of the claims 1 to 8] claim 1 for the de-enrichment of tritium from heavy water, with deuterium being used as gaseous substance (G) and the heavy water forming the liquid substance (L), with tritium being taken up from this substance by the deuterium and with the deuterium which is charged with the tritium being regenerated in a low temperature column (6), with tritium being separated off.

10. (amended) Use of a column in accordance with [any one of the claims 1 to 8] claim 1 for the winning of heavy water, with hydrogen which contains deuterium forming the gaseous substance (G) and with deuterium being given off from this substance to heavy water, which forms the liquid substance (L), with light hydrogen (protium) simultaneously being taken up.